

with numerous brown spots, which are small and rounded on the hinder part of the tail and on the adipose fin.

The single specimen is stuffed, and 29 inches long.

Synodontis labeo.

D. 1/7. A. 12. P. 1/9. V. 7.

This species is very similar to *S. xiphias*; but the snout terminates in a large, soft, globular swelling, instead of a conical pointed process. Humeral process twice as long as broad, with an obtuse point behind, slightly turned upwards. Angle of the mouth with a black cutaneous flap or prominence (shrivelled up in our specimen).

In all other characters this remarkable species agrees with *S. xiphias*, as far as we can see from the single stuffed example in the collection; it is 33 inches long.

XLIX.—On the Sexes of the Alcyonaria.

By M. LACAZE-DUTHIERS*.

NATURALISTS have paid less attention to the reproduction of the Coralliaria than to their external characters. At this we may justly feel surprised, when we consider that in other divisions of zoophytes the study of the phenomena which govern the preservation of the species has led to the most important discoveries.

In the different memoirs that I have presented to the Academy I have endeavoured to make known the sexual conditions which are met with in widely separated types, such as *Corallum*, *Antipathes*, *Gerardia*, &c. In the present paper, leaving on one side the isolated species, I propose to give a summary of the more general facts relating to the very natural division of the *Alcyonaria*; and for this purpose I shall take my examples partly from the species in which the zoanthodema is fixed, and partly from the *Pennatulidæ*, of which the polyparies always remain free.

In *Corallum* the genital glands are sometimes separated, sometimes united, either in the same polype or in the same zoanthodema; but, although hermaphroditism sometimes occurs, it must be confessed that the separation of the sexes appears to be the most usual condition; it appears even to become the general rule in the entire group of the *Alcyonaria*, if we may judge from the following genera and species—*Gorgonia subtilis*, *G. tuberculata*, *Muricea placomus*, *M. violacea*, *Primnoa verticil-*

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laris, *Bebryce mollis*, *Alcyonium palmatum*, *A. digitatum*, and *Paralcyonium elegans*—in which there is no doubt that not only the polypes, but even the zoanthodemata are unisexual.

The observations which form the subject of the present memoir, having been greatly multiplied throughout two consecutive springs and summers, appear to have furnished certain results; nevertheless it must not be forgotten that it is very difficult to assert absolutely that a large specimen, often containing several thousand polypes, has not a single animal of a different sex from that which appears to exist in it exclusively; I must therefore make every reservation with regard to any exceptions that may present themselves.

In order to ascertain the nature of the genital glands, we must always commence by a microscopic examination and histological investigation of the characteristic elements—that is to say, by recognizing the *spermatozoid* and the *ovum*. This is the only means of obtaining certain results, which may afterwards allow us to judge rapidly of the sexes, on the condition, however, that the productive organs of these elements, or these elements themselves, present such differences as may be appreciable by the naked eye.

When the ovum and the testes present at the same time the same form and the same colour, it is impossible to distinguish them without the microscope; and in this case it will be understood how laborious the observations become. But fortunately this is very rarely the case, for almost always these elements present some prominent differences.

In *Gorgonia subtilis*, for example, the ova are of a splendid carmine rose-colour, whilst the male organs are colourless: the former are large, and rarely exceed two or three in number; the latter, on the contrary, are small, and form eight racemose packets, each composed of ten capsules. This fact once ascertained by the microscope, it is easy, by means of large incisions, or even by simply tearing the sarcosoma with the nail, to distinguish the male and female zoanthodemata very rapidly. I have very often done this without ever being deceived, although the fishermen brought me specimens by hundreds. The observation of *Gorgonia subtilis* is so easy, and furnishes such precise results, that it may serve as a type of researches of this kind.

In the *Muriceæ* the ova have a bright colour, resembling that of the sarcosoma; the testicular capsules, on the contrary, are very pale or nearly colourless. One of the species, *M. placomus*, which abounds on the coralligenous banks of the Mediterranean, is of a fine slightly yellow orange-colour, but without brilliancy; its ova are of the same tint, but their shade is redder, brighter, and more brilliant; its testes are sometimes nearly white, but

most frequently of a pale orange. The other species, *M. violacea*, has its tissues of the most beautiful violet that can be imagined; its ova are of a softer shade, in which blue predominates; its testes are scarcely tinged with a slight tint in which blue predominates still more. But in these two species, whilst the secretion of the ovaries is always reduced to about ten ova, the testis produces eight packets formed of from six to twelve capsules. It is therefore easy with the lens, or even with the naked eye, to ascertain the sex of these species; and it is only quite exceptionally that I have found upon the same zoanthodema the two kinds of genital glands.

We should only have to repeat the same things with regard to *Primnoa verticillaris*, *Alcyonium digitatum*, and *A. palmatum*. In the two latter species, when we give a broad scalpel-cut into the lobate fleshy mass of which their zoanthodemata consist, we see, if the animals are breeding, thousands of ova or of testicular capsules separating from the long pedicels which bear them, as in all *Alcyonaria*, and escaping from the cavities of the polypes.

Bebryce mollis might sometimes seem to form an exception: but it is to be remarked that its zoanthodemata, when they meet, become soldered together and confounded; so that sometimes it must appear that there is only a single colony of both sexes, when in reality the sexes have been originally distinct, and the appearance of bisexuality is the result of a graft by approach.

Alcyonium palmatum lives well and for a long time in aquaria; so that it is easily observed. When it is well expanded and much inflated, it shows, shining through its attenuated walls, the numerous globules of the interior of its cavities, which may easily be recognized as ova or testes from the difference in their form and size.

In *Juncella elongata* the parenchyma is of a fine sienna-colour; the ova are large, not numerous, and white: it is therefore easy to ascertain the sex in this species without the aid of magnifying-instruments, after having positively determined histologically the nature of the glands.

Thus in the species of *Alcyonaria* with a fixed base, living in the Mediterranean, the sexes appear to be always separate; for the polypes, like the zoanthodemata, only present one kind of genital glands.

In the *Pennatulidæ* or free *Alcyonaria* the same thing is presented. In *Pennatula grisea*, *P. rubra*, and *P. granulosa* I have never found the sexes united; but I must add that I have examined a far smaller number of individuals than in the case of the other *Alcyonaria*.

It is hardly possible to investigate the phenomena of reproduction in the lower divisions of the animal kingdom without

directing one's attention to the peculiar conditions often presented in the lower animals by the multiplication and metamorphosis of individuals. Although I have sought carefully in the group to which I have just been referring for alternations between a sexual and an agamic generation, I have never met with it. The number of zoanthodemata is only increased sexually. Blastogenesis or gemmation extends the zoanthodemata or colonies by multiplying the number of inhabitants in each of them; but these budded individuals are soon sexual, resemble those from which they are derived, and assist in reproduction by fecundation, without presenting any peculiarity except their origin.

It is constantly the case in the whole of this group that fecundation takes place in the general cavity of the body of the female, or even in the ovary, and that the female hatches her ova after impregnation; thus she does not produce eggs, but, by a true parturition, rejects by the mouth ciliated vermiform embryos or larvæ, which attach themselves after having for a short time enjoyed complete freedom.

L.—*Observations on Raphides and other Crystals in Plants*.

By GEORGE GULLIVER, F.R.S.

[Continued from p. 382.]

Dictyogenæ.—At the end of the last communication, the deficiency of raphides in the Cryptogameæ Ductulosæ was noticed, as well as in Potamogetonaceæ, Naiadaceæ, Cyperaceæ, and Gramineæ, which four orders conclude the class Monocotyledones in the 'Manual of British Botany;' and I had before shown how raphides constantly abound in the subdivision Dictyogenæ, therein placed at the beginning of this class.

Now the orders Coniferæ and Hydrocharidaceæ, between which is the position of Dictyogenæ in the lineal series of the natural arrangement of that book, are as regularly devoid of raphides. Extending the inquiry from the flora of Britain to that of the world, the facts, as far as my observations have yet gone, are to the same effect. Thus the fifth class in Prof. Lindley's 'Vegetable Kingdom' is formed by the Dictyogens, and placed lineally between his Alismal Alliance and Gymnogens. But in no order of these last two groups have I yet found raphides, though I have searched some of the exotic as well as all but one of the indigenous species; while every plant belonging to the Dictyogens, either native or foreign, that has ever come under my examination was constantly found abounding in raphides.

Hence, besides the diagnostics already described by systematic